

EXPERIMENTAL DETERMINATION OF CROSS SECTION OF D-INDUCED REACTIONS ON ^{nat}Pd

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In our ongoing effort of systematic investigation of cross sections of nuclear reactions induced by light charged particles we recently studied the production of Ag radionuclides from natPd targets. We present here the experimental results for the deuteron induced reactions between thresholds and 21 MeV for the short lived ($T_{1/2} < 4\text{h}$) radionuclides $^{103,104,112}\text{Ag}$ and for the longer lived $^{105,106m,110m,111}\text{Ag}$. Two stacks containing high purity natPd foils (thickness 7.99 micron) were irradiated at the VUB cyclotron with 20.5 and 15.1 MeV deuteron beams. The number of foils assured covering of the whole energy range down to the threshold of the (d,xn) reactions and resulted in energy overlap between the 2 stacks. Interleaved high purity Ti foils served as monitors to obtain reliable characteristics (energy and intensity) for the deuteron beam by comparison of the cross sections of the $^{nat}\text{Ti(d,x)}^{48}\text{V}$ reaction with reference values over the whole energy range studied. These foils also allowed to check the energy degradation in the stacks. Direct γ -spectrometry starting from a 1 hour after EOB up to after several weeks resulted in the identification and quantification of the activity induced for the different radionuclides studied. Excitation curves and production capabilities for the medically relevant $^{104m,g}\text{Ag}$ (PET imaging) and ^{111}Ag (therapeutic applications) are presented and the contamination with ^{110m}Ag is discussed. The excitation function for the $^{104}\text{Pd(d,3n)}^{103}\text{Ag}$ reaction (leading to a precursor of therapeutic ^{103}Pd) allows to conclude that this pathway is not an alternative production route for ^{103}Pd . Also for the reactions leading to the longer lived $^{105,106m}\text{Ag}$, useful in Thin Layer Activation and as markers, the cross sections and the thick target yields are presented. As detailed excitation functions for nearly all these reactions are measured here for the first time only limited comparison with literature values (thick target yields obtained by Dmitriev et al [1]) is reported. For all reaction products the contribution of the different (d,xn) channels on the individual stable Pd isotopes present in natPd are calculated by the ALICE-IPPE code.

[1] P.P. Dmitriev, M.V. Panarin, Z.P. Dmitrieva, Atomnaya Energia, 50, (1981), p418